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ABSTRACT

This study examined the differences and similarities experienced by secondary school science teachers when teaching science within and outside their area of specialization in single sex and co-educational schools. Interviews were conducted and audio taped for six experienced science teachers on their qualification, classes/subjects taught and teaching experience. To ensure that each teacher's perspective was heard, each interview was reviewed, and agreement about the meaning was built to the satisfaction of the teachers. On analyzing the differences and similarities in the teachers experiences, it was found that those teaching out of their areas of specialization found it difficult structuring their lessons, getting back on track when drawn away from their original lesson plan and were sometimes unable to construct explanation in response to students (especially male) questions. The importance of training more science teachers in specific fields, assigning teachers to teach within their areas of specialization and creating a learning environment that promotes equity is discussed. (Contains 14 references.) (Author)

TEACHING SCIENCE COURSES IN AND OUT OF AREA OF SPECIALISATION IN A SINGLE-SEX/CO-EDUCATIONAL SCHOOLS.

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ABSTRACT

The study examined the differences and similarities experienced by secondary school science teachers when teaching science within and outside their area of specialisation in single sex and co-educational schools. Interviews were conducted and audio taped for six experienced science teachers on their qualification, classes/subjects taught and teaching experience. To ensure that each teachers perspective was heard, each interview was reviewed, and agreement about the meaning was built to the satisfaction of the teachers. On analysing the differences and similarities in the teachers experiences, it was found that those teaching outside their areas of specialisation found it difficult structuring their lessons, getting back on track when drawn away from their original lesson plan and were sometimes unable to construct explanation in response to students (especially male) questions. The importance of training more science teachers in specific fields, assigning teacher to teach within their areas of specialisation and creating a learning environment that promotes equity is discussed.

INTRODUCTION

Due to the shortage of science teachers in Nigeria, quite a number of science teachers have had to teach science courses outside their area of specialisation/certification. (Maduabum 1990). In fact this is even more pronounced in integrated science taught at the Junior Secondary School level. The choice of integrated science at this stage is based on sound pedagogical standpoints which presents the whole of science as the intricately intertwined and intellectually integrated enterprise.

Over a decade ago, Jegede (1982) found that most of the integrated science teachers are of single subject specialisation who felt more comfortable teaching topics that pertained to their own areas and as a consequence taught only selected topics to the students as opposed to teaching from unit to unit sequentially as presented in the books. This according to him is based on the sound principles of teaching what one knows.

But recent studies of teacher knowledge have revealed that experienced teachers develop a knowledge base over time that includes content knowledge, pedagogical knowledge and pedagogical content knowledge. According to sanders et al (1993), pedagogical content knowledge enables a teacher to transform the content knowledge into a form that students can use. For as the teachers develop more expertise in their teaching, they should be able to transform knowledge in many different ways. Usually teachers want to provide the best instruction and create the best learning environment for their students, yet researches indicate that female are getting a significantly poorer science education than males even when they are in the same classroom. (Baker 1987, 1988)

The present study therefore examined the differences experienced by secondary school science teachers when teaching classes within and outside their areas of specialisation in single sex and co-educational schools.

PARTICIPANTS

This includes six randomly selected experienced secondary school science teachers in the Northern part of Nigeria. Three of these teachers are from a single sex and the remaining three from co-educational schools both of comparable educational standard (SSCE RESULTS).

These teachers identified as good teacher by their principals have been teaching some of the science subjects in their various schools for a minimum of 3 years.

The teachers were interviewed in their respective schools on their qualification, the class taught, areas of certification subject taught in the past and the number of years the present subject has been taught, experience in teaching in single sex or co-educational schools and so on. The areas of certification included Biology and Chemistry and the unfamiliar areas were Mathematics, Physics and some aspect of Integrated Science. These unfamiliar areas are usually outside the area of certification and one in which the teachers had little or no previous teaching experience.

INTERVIEWS

Interviews were conducted and audio taped with each participant. The questions and conversation during these interviews were purposely open-ended and questioned what was happening in the classrooms (single sex and co-educational) when teaching science outside and within the areas of specialisation. This allowed for greater insight into the teachers underlying philosophies and rationale for the teaching method of actions used in the classroom. According to Cohen (1981) such interviews need to be dialogues so that "Each person's unique blend of bio-psycho-social life aspects is shared" (p. 22). Therefore, to ensure that the teachers perspective was heard, each interview was reviewed, commented on and discussed and agreement about meaning was built. (Douglas 1976).

THE TEACHERS

The teachers at the beginning of the interview were assured of anonymity. This is imperative because of the policies in schools. This also made the teachers very free in their expressions. Pseudonyms were assigned which makes it more difficult to distinguish among the teachers except for sex. The six pseudonyms used were Sule, Ibrahim, Aishatu, Binta, Fatima, Laraba. Below is the interview recorded as transcribed for Ibrahim who was certified in biology and was teaching integrated science (JSS II) in a single sex school. Ibrahim has been teaching for 5 years.

Q. What subject do you teach in your present class/classes?

A. I teach Integrated Science to junior secondary two students Grade.

Q. You mean you've been involved one time or the other in teaching physics, chemistry, biology and integrated science.
Which of these subjects do you enjoy teaching?

A. I enjoy teaching physics and chemistry. I took these subjects up to A levels and the fact that I ended up (certified) with Biology is for the Higher Grade I had in it.

Q. Should you be required to structure a lesson plan on a topic in any of these areas, which would be more tasking?.

A. I definately find it difficult structuring lessons in integrated science since it is not my area of specialisation.

Q. Have you ever taught in a co-education school?

A. Yes, just before I came to this school.

Q. How can you compare your experiences in teaching these subjects in both schools (single sex and co-educated).

A. Whichever subject, it's definately more challenging to teach in male schools but you have to put in extra efforts to face the challenge in the integrated science classroom. But one thing I also noticed is that the female students are usually more interesting with challenges when they are much younger, but as they grow older, they loose concentrate. Unlike their male counterparts who are less serious initially and get more serious in later years.

Q. .....

The interview above reveals a typical "mix up" of a science teacher - certified in Biology, enjoy teaching chemistry and physics and ends up in the integrated science class.
On the other hand, it will be interesting to examine Ai'shatu response to some of these questions. Ai'shatu was

Q Is this what you've been teaching for the past 5 years?
A I taught Biology for 2yrs and chemistry for 1yr when the chemistry teacher went on maternity leave. I also used to teach physics during extra lessons.

certified in Chemistry (B.Sc Ed) and teaching Physics to senior secondary one students. She has been teaching for the past 8 years.

Q. Do you feel comfortable teaching Physics in your present class?

A. I would have preferred teaching chemistry since that is my area of certification, in fact I sometimes get confused and loose track of the lesson. But since the school has shortage of Physics teachers, I do the best I can.

Q. Would it have made a difference if you teach Physics in a single sex school?

A. Yes, I would have preferred teaching in a single sex female school since the girls in my present class are less challenging. But the moment I see any boy raising up his hands to ask questions in my physics class, I get scared of not being able to answer such questions.

The interview went round all the six teachers but because of space limitations, only selected examples are given here.

DATA ANALYSIS

Glaser and Strauss (1967) constant comparative method which was also used by Sickle and Spector (1996) was used during the data analysis.

After raw data were transcribed from the tapes, they were read several times until emerging categories were discerned. In order to ensure that the researchers' interpretations and categories were consistent with the participants thoughts, the teachers were given the interview transcripts to ascertain (Douglas 1976). The teachers agreed with the interpretations.

RESULTS AND DISCUSSION
TABLE 1

S/NO.	TEACHERS	SCHOOL	QUALIFICATION	YEARS OF EXPERIENCE	SCIENCE SUBJECT TAUGHT PRESENTLY	SCIENCE SUBJECT TAUGHT IN THE PAST	SUBJECT MORE COMFORTABLE TO TEACH
1.	Ibrahim	Single Sex	B.Sc Ed Biology	5 years	Integrated Science	Biology Chemistry Physics	Physics Chemistry
2.	Ai'shatu	Co-edn	B.Sc Ed Chemistry	8 years	Physics	Integrated Science	Chemistry
3.	Binta	Co-edn	B.Sc Ed Chemistry, M.Ed Sc. Ed	6 years	Integrated Science Mathematics	Chemistry	Chemistry
4.	Fatimah	Single Sex	B. Sc Ed, Biology	8 years	Biology	Biology	Biology
5.	Laraba	Single Sex	B.Sc Ed Biology	10 years	Biology Int. Science	Biology	Biology
6.	Sule	Co-edn	B.Sc Ed, Chemistry	3 years	Chemistry Int. Science	Integrated Science	Chemistry

Out of the six teachers interviewed only one (16.67%) teaches in the area of certification. Three of the teachers (50%) are completely out of the area of certification whereas the remaining two (33.33%) are still within and out of the areas of specialisation.

It is quite interesting that most of the teachers (66.67%) teach integrated science in their respective schools instead of their areas of certification. This supports Jegede (1982), Odubunmi (1980): and Olarewaju & Balogun (1984) findings that most for the Nigerian Integrated science teachers are of single subject specialisation and these teachers are being asked to teach what they have not learned. Maduabum (1990) also found that 91.1% of teachers teaching integrated science in schools are unqualified teachers - that is do not have the requisite knowledge skills to handle the subject effectively. This is not surprising since it is only of recent that a few Universities in Nigeria mounted integrated science degree programmes. Hence the shortage of teachers in this area, the discomfort exercised by all the teachers involved and the preference for their areas of certification.

Also three of the teachers (Ai'shatu, Binta & Sule) teaching outside their areas of specialisation expressed the fact that they sometimes ended up confused. Like novice teachers in other studies (Borko & Livingston 1989; Leinhardt & Greeno 1986) when teaching outside the areas of specialisation, these teachers expressed difficulty getting back on track when drawn away from their original lesson plans and they are sometimes unable to construct explanations in response to students questions. Also like the novices in Hashweh's (1987) and Sanders et al 1993 research, they had difficulty structuring the lessons and responding to student questions because they were not familiar with the specifics of the content or the relationships between different aspects of the content. For Fatimah and Laraba who teach Biology in their area of certification there is no such problems either in co-educational or single sex school. In fact, according to Fatimah "Teaching Biology has become a part of me. I have the store of information just in my head".

On the contrary, while one would stress the importance of keeping teachers within their areas of certification, Ibrahim a Biology graduate feel more comfortable teaching Physics/Chemistry. According to him "the fact that I ended up with biology is for the higher grade I had in it at

A'level". Of particular interest is the response gather from all the six teachers as regards teaching the unfamiliar subjects in single sex or educational schools.

All the teachers agreed on the fact that it is more challenging to teach in a single sex male school or male students generally. The male students are said to be more serious than the females and the teacher would require to spend more time to prepare for the lesson to cope with the challenge. When teaching the unfamiliar subject Ai'shatu remarked" the moment I see any boy raising up his hands to ask questions in my Physics class, I get scared of not being able to answer such questions". But this does not happen at all levels from Ibrahim's observation. According to him, the female students usually feel more excited to learn and poses challenges to teachers when they are at the Junior levels unlike their male counter-parts who are less serious at this stage. But as they grow older, the female ones loose concentration as the male students pick up. This lack of concentration might be due to early marriages for girls in the Northern part of Nigeria at this age (stage):

Finally after analysing the differences and similarities in the teachers experiences, the importance of assigning teachers to teach within their areas of specialisation cannot be over-emphasised. But this is handicapped by the lack of qualified teachers in some of the various disciplines. Hence the need to encourage and train more teachers in these fields.

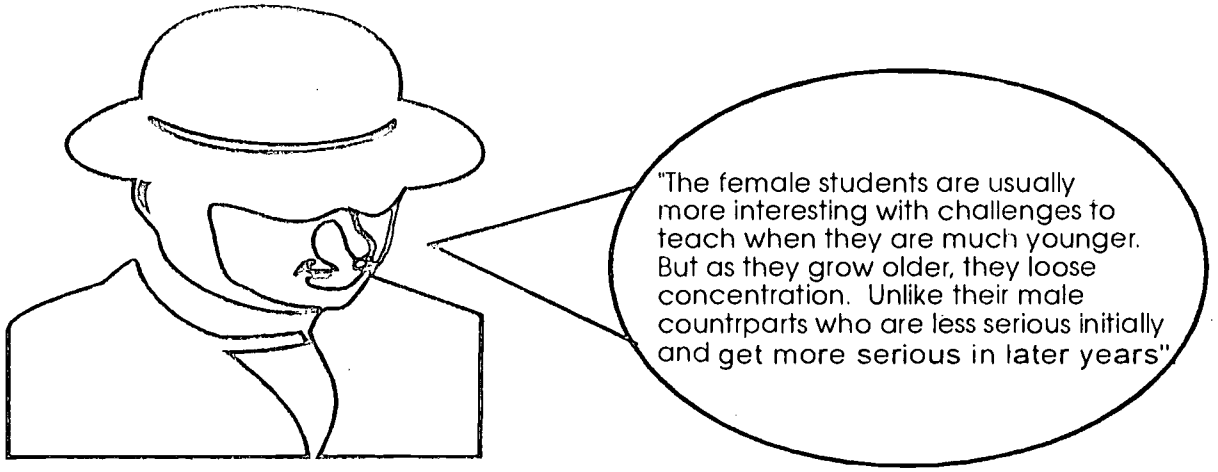
The male - female differences in attitude towards school noticed in the classroom, can be traced to the teacher student interactions which are the clearest form of classroom inequalities. In most cases where the teacher has the content knowledge, boys more often than girls are called to answer questions or asked more higher order questions. Teachers fail to see girls raised hands and limit their interactions with girls to social non-academic topics (Baker 1988). No wonder some of the teachers in the present study when teaching unfamiliar areas are more scared of questions coming from the boys. Although changing behaviour and creating a learning environment that promotes equity takes time and effort. It must be encouraged.

"Teaching Biology has become a part of me. I have the store of information just in my head".

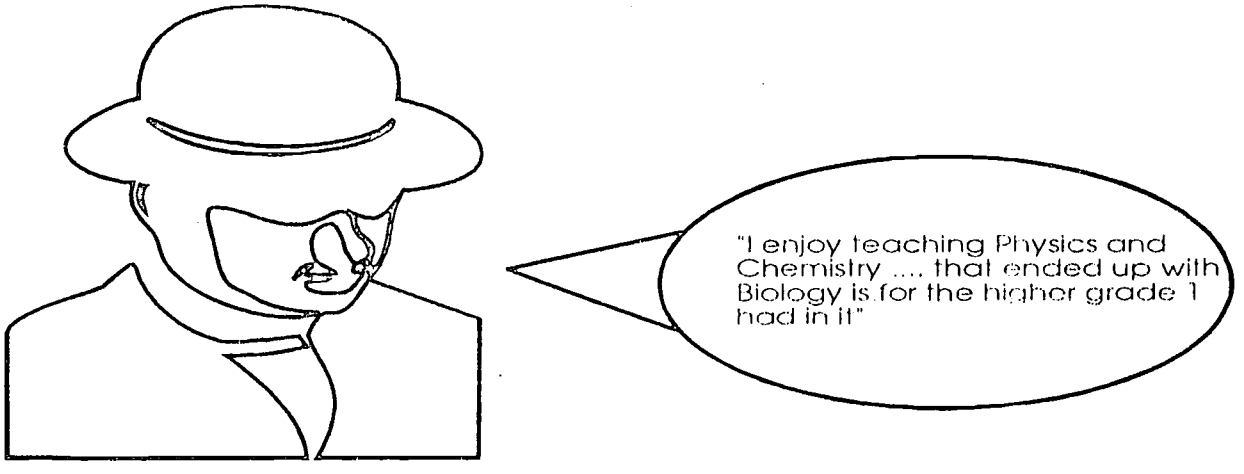
Fatimah,
certified in Biology,
teaches Biology

"I would have preferred teaching Chemistry..... infact I sometimes get confussed and loose track of the lesson .... the moment I see any boy raising up his hands to ask questions in my physics class, I get scared of not being able to answer such questions".

Aishatu
certified Chemistry,
teaches Physics.



Ibrahim
certified in Biology,
teaches Int. Science.



Ibrahim
certified in Biology,
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